

REMARKS

This responds to the Office Action mailed on April 7, 2004.

Claims 5, 24, and 34 are canceled and claim 41 is added, as a result, claims 1, 3, 7-11, 21-23, 26-28, 31-33, 36-38, and 41 are now pending in this application.

Claim Rejection Under 35 USC § 112:

Claims 5, 24, and 34 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claims 5, 24, and 34 have been cancelled.

§102 Rejection of the Claims

Claims 1, 3, 5, 7-11, 21-24, 26-28, 31-34, and 36-38 were rejected under 35 USC § 102(e) as being anticipated by Yin et al. (U.S. 2002/00140056 A1). The Yin et al. patent does not describe a method for reducing profile distortion in semiconductor fabrication using deep ultraviolet lithography without roughening a semiconductor substrate surface, as is claimed. Furthermore, as acknowledged by the Examiner, the Yin et al. patent application does not describe treating the resist with UV light. The Examiner states that “Yin et al. teaches that any well-known technique can be used to treat the photoresist.” However, what is claimed is a method directed to including deep ultraviolet lithography, which is not described in the Yin et al. application. In order to anticipate a claim, a reference must have each and every element claimed. In the present instance, the Yin et al. reference does not describe a method for reducing profile distortion in semiconductor fabrication using deep ultraviolet lithography without roughening a semiconductor substrate surface, as is claimed. The Yin et al. reference does not describe the UV lithography that is claimed. The Yin et al. reference does not then anticipate the claims of the invention. The Examiner’s argument appears to be one based upon obviousness, rather than anticipation because the Yin et al. application does not describe each and every element claimed..

Claim Rejection Under 35 USC § 103:

Claims 1, 3, 5, 7-11, 21-24, 26-28, 31-34, and 36-38 were rejected under 35 USC § 103(a) as being unpatentable over Knight et al., U.S. Patent No. 5,486,267 ('267) in view of Lin et al., U.S. Patent No. 6,143,666 ('666). The Applicant respectfully disagrees with the Examiner's ground of rejection for the reasons set forth. The Knight patent, '267, describes treating a tetraethoxysilane based silicon dioxide film with a mixture of 3900 sccm, ozone and nitrous oxide. The Knight reference does not describe "A method for reducing profile distortion in semiconductor fabrication using deep ultraviolet lithography without roughening a semiconductor substrate surface," as is claimed.

Furthermore, as acknowledged by the Examiner, the Knight patent describes an ozone plasma at a temperature of 400 degrees C. and a pressure of 30 Torr. The present invention uses an oxygen plasma at a pressure of 3.0-6.5 Torr. The Knight patent describes a pressure far outside of the range claimed. Knight also describes an atmosphere of ozone, oxygen, helium and TEOS at 30 Torr. In another embodiment, Knight describes an atmosphere of 15 slm oxygen with 40% by weight ozone and 0.5 slm of nitrous oxide at 300C, under 1 atmosphere pressure. In each of these examples, the pressure and oxygen flowrate is outside of the range claimed.

The Lin patent describes and claims treating silicon oxide films, not treating silicon nitride films, as is claimed. The first "preferred embodiment" in the Lin patent describes treating a silicon oxide with an oxygen plasma. The second "preferred embodiment" in the Lin patent describes using TEOS as the silicon source material. The top of column 12 of the Lin patent describes a use of PVD sputtering methods to describe formation of pre-metal dielectric layers that include silicon nitride and silicon oxynitride. These dielectric layers are not described as being treated in accordance with the claims of the present invention, however. Thus, if anything, the Lin reference teaches away from the claims of the present invention.

Further, the Lin patent describes methods for enhancing adhesion of a photoresist layer to a dielectric layer and in doing so, addresses treating a silicon oxide surface and not a silicon nitride surface. The Lin patent does not describe a method for reducing profile distortion in semiconductor fabrication using deep ultraviolet lithography without roughening a semiconductor substrate surface, as is claimed.

In the method of the claimed invention, the oxygen rate is at least about 300 sccm. This claimed treatment step is part of a process for reducing profile distortion in semiconductor fabrication. This claimed treatment is different from the treatment described in the Lin patent which is for increasing adhesion of a silicon oxide layer. The combination of Knight and Lin is not suggested because the treatment methods are for different objectives, and employ treatment ranges that conflict with each other—i.e. a very high oxygen flowrate at a low pressure for Lin and a lower flowrate at an elevated pressure for Knight. Furthermore, neither reference describes a process for reducing profile distortion in semiconductor fabrication using deep ultraviolet lithography without roughening a semiconductor substrate surface,” as is claimed.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 373-6976 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

ZHIPING YIN ET AL.

By their Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. Box 2938
Minneapolis, MN 55402
(612) 373-6976

Date 07 September 04

By J. M. Kalis
Janal M. Kalis
Reg. No. 37,650

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 7th day of September, 2004.

Tina Kohout
Name

Z. Yin
Signature